APPENDIX E

- Estimating Pollutant Load Reductions for Section 319 Grant Projects

Estimating Load Reductions For Agricultural and Urban BMPs

This workbook uses the "Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual" (Michigan Department of Environmental Quality, June 1999) to provide a gross estimate of sediment and nutrient load reductions from the implementation of agricultural BMPs. The methodolgy for the gross estimate of sediment and other constituent load reductions from the implementation of urban BMPs is based on reduction efficiencies and calculations developed by Illinois EPA.

Please note: This workbook uses many simplifying assumptions to provide a general ESTIMATE of pollutant load reductions through BMP implementation. More accurate results of pollutant load reductions may be obtained through direct monitoring and/or a more detailed modeling application. In addition, this workbook does not estimate pollutant load reductions for dissolved constituents.

The workbook is divided into worksheets (see bottom of the Window). Each worksheet is specific to a particular source. In some cases, multiple practices may take place for a specific site, then the various worksheets will all need to be completed; oneworksheet must be completed for each BMP. The following are the worksheets and what practices they cover:

Worksheet	Possible Practices
Gully Stabilization	Grade Stabilization Structure Grassed Waterway Critical Area Planting in areas with gullies Water and Sediment Control Basins
Bank Stabilization	Animal Trails and Walkways Stream Channel Stabilization Streambank Protection
Agricultural Fields	Prescribed Grazing Residue Management, Mulch Till Conservation Crop Rotation Conservation Cover Cover and Green Manure Critical Area Planting Stripcropping, Contour Stripcropping, Field Filter Strips
Feedlots	Animal Waste Systems
Urban Runoff	Vegetated Filter Strips Grass Swales Infiltration Devises Extended Wet Detention Wetland Detention Dry Detention Settling Basin Sand Filters WQ Inlets Weekly Street Sweeping Infiltration Basin Infiltration Trench Porous Pavement Concrete Grid Pavement Sand Filter/Infiltration Basin WQ Inlet w/ Sand Filter Oil/Grit Seperator Wet Pond

Specific instructions are provided within each worksheet area. For questions regarding the operation of this workbook, please contact Wes Stone (317/233-6299).

Gully Stabilization

These may include:

Grade Stabilization Structure
Grassed Waterway
Critical Area Planting in areas with gullies
Water and Sediment Control Basins

Please fill in the gray areas below. Once you have successfully estimated the sediment and nutrient load reductions, please print two (2) copies this worksheet. Attach both copies to the 319A or 319U cost-share form.
If you have any questions, please contact Wes Stone (317/233-6299).

		Example
IDEM Project Manager:		**WWS**
Project ARN:		**99-787**
Landowner Initials:		**HJK**
Date practices completed:		**8/30/99**

Please select a soil textural class:

○ Sands, loamy sands	○ Silty clay loam, silty clay
○ Sandy loam	○ Clay loam
○ Fine sandy loam	○ Clay
○ Loams, sandy clay loams, sandy clay	○ Organic
◉ Silt loam	

Parameter	**Gully**	**Example**	
Top Width (ft)	13	**15**	
Bottom Width (ft)	2	**4**	
Depth (ft)	1.5	**5**	
Length (ft)	300	**20**	
Number of Years	5	**5**	
Soil P Conc (lb/lb soil)*	0.0005	**0.0005**	*
Soil N Conc (lb/lb soil)*	0.001	**0.001**	*

* indicates default values for Total P and Total N soil concentrations

Estimated Load Reductions

	Gully	**Example**
Sediment Load Reduction (ton/year)	29	**10**
Phosphorus Load Reduction (lb/year)	29	**8**
Nitrogen Load Reduction (lb/yr)	57	**16**

Bank Stabilization

Please fill in the gray areas below. If estimating for just one bank, put "0" in areas for Bank #2.
Once you have successfully estimated the sediment and nutrient load reductions,
please print two (2) copies of this worksheet. Attach both copies to the 319A or 319U cost-share form.

If you have any questions, please contact Wes Stone (317/233-6299).

		Example
IDEM Project Manager:		**WWS**
Project ARN:		**95-992**
Landowner Initials:		**HJK**
Date practices completed:		**8/8/99**

Please select a soil textural class:

○ Sands, loamy sands	○ Silty clay loam, silty clay
○ Sandy loam	○ Clay loam
○ Fine sandy loam	○ Clay
○ Loams, sandy clay loams, sandy clay	○ Organic
◉ Silt loam	

Parameter	Bank #1	Bank #2	**Example**	
Length (ft)	500	500	**500**	
Height (ft)	10	10	**15**	
Lateral Recession Rate (ft/yr)*	0.2	0.2	**0.5**	
Soil P Conc (lb/lb soil)**	0.0005	0.0005	**0.0005**	**
Soil N Conc (lb/lb soil)**	0.001	0.001	**0.001**	**

** indicates default values for Total P and Total N soil concentrations
*Lateral Recession Rate (LRR) is the rate at which bank deterioration has taken place and is measured in feet per year. This rate may not be easily determined by direct measurement. Therefore best professional judgement may be required to estimate the LRR. Please refer to the narrative descriptions in Table 1.

Table 1

LRR (ft/yr)	**Category**	**Description**
0.01 - 0.05	Slight	Some bare bank but active erosion not readily apparent. Some rills but no vegetative overhang.
0.06 - 0.2	Moderate	Bank is predominantly bare with some rills and vegetative overhang.
0.3 - 0.5	Severe	Bank is bare with rills and severe vegetative overhang. Many exposed tree roots and some fallen trees and slumps or slips. Some changes in cultural features such as fence corners missing and realignment of roads or trails. Channel cross-section becomes more U-shaped as opposed to V-shaped.
0.5+	Very Severe	Bank is bare with gullies and severe vegetative overhang. Many fallen trees, drains and culverts eroding out and changes in cultural features as above. Massive slips or washouts common. Channel cross-section is U-shaped and streamcourse or gully may be meandering.

Source: Steffen, L.J. 1982. Channel Erosion (personal communication), as printed in "Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual," June 1999 Revision; Michigan Department of Environmental Quality - Surface Water Quality Division - Nonpoint Source Unit. EQP 5841 (6/99).

Estimated Load Reductions

	Bank #1	**Bank #2**	**Example**
Sediment Load Reduction (ton/year)	43	43	**150**
Phosphorus Load Reduction (lb/year)	43	43	**150**
Nitrogen Load Reduction (lb/yr)	85	85	**300**

Agricultural Fields and Filter Strips

Please fill in the gray areas below. Once you have successfully estimated
the sediment and nutrient load reductions, please print two (2) copies of this worksheet.
Attach both copies to the 319A or 319U cost-share form.
If you have any questions, please contact Wes Stone (317/233-6299).

These may include:
Prescribed Grazing
Residue Management, Mulch Till
Conservation Crop Rotation
Conservation Cover
Cover and Green Manure
Critical Area Planting
Stripcropping, Contour
Stripcropping, Field
Filter Strips

		Example
IDEM Project Manager:		**WWS**
Project ARN:		**95-992**
Landowner Initials:		**HJK**
Date practices completed:		**8/8/99**

Please check which BMPs apply:

- ☐ Agricultural Field Practices
- ☐ Filter Strips

RUSLE	Before Treatment	After Treatment	Example Before Treatment	Example After Treatment
Rainfall-Runoff Erosivity Factor (R)	150	150	**120**	**120**
Soil Erodibility Factor (K)	0.4	0.4	**0.35**	**0.35**
Length-Slope Factor (LS)	0.55	0.55	**0.44**	**0.44**
Cover Management Factor (C)	0.2	0.04	**0.7**	**0.5**
Support Practice Factor (P)	1	1	**0.775**	**0.11**
Predicted Avg Annual Soil Loss (ton/acre/year)	6.60	1.32	**10.03**	**1.02**

		Example
Contributing Area (acres)	50	**14**

The portion of the treated field which contributes eroded soil to the waterbody. The contributing area is defined by the runoff flowpath and by topography and may differ in size from the actual treated field.

Please select a gross soil texture:

- ○ Clay (clay, clay loam, and silt clay)
- ○ Silt (silt, silty clay loam, loam, and silt loam)
- ○ Sand (sand, sandy clay, sandy clay loam, sandy loam, and loamy sand)
- ◉ Peat

Estimated Load Reductions for Agricultural Field Practices

	Treated	Example
Sediment Load Reduction (ton/year)	152	**85**
Phosphorus Load Reduction (lb/year)	253	**100**
Nitrogen Load Reduction (lb/yr)	506	**200**

Estimated Additional Load Reductions through Filter Strips

	Filter Strips	Example
Sediment Load Reduction (ton/year)	25	**92**
Phosphorus Load Reduction (lb/year)	72	**114**
Nitrogen Load Reduction (lb/yr)	135	**227**

Total Estimated Load Reductions

	Total	Example
Sediment Load Reduction (ton/year)	177	**177**
Phosphorus Load Reduction (lb/year)	326	**214**
Nitrogen Load Reduction (lb/yr)	642	**427**

Feedlot Pollution Reduction

Please fill in the gray areas below. Once you have successfully estimated
the sediment and nutrient load reductions, please print two (2) copies this worksheet.
Attach both copies to the 319A or 319U cost-share form.
If you have any questions, please contact Wes Stone (317/233-6299).

Notes: An animal lot refers to an open lot or combination of open lots intended for confined feeding, breeding, raising or holding animals. It is specifically designed as a confinement area in which manure accumulates or where the concentration of animals is such that vegetation cannot be maintained. The purpose of these calculations is to represent Chemical Oxygen Demand (COD) and phosphorus (P) reductions after an animal waste system is installed. This method has two assumptions: 1) the feedlot is adjacent to a receiving hydrological system without any buffering areas; and 2) installing the animal waste system will prevent any further pollutants from the lot from reaching the hydrologic system. Feedlots that cannot show impact to the hydrologic system being protected should not be evaluated with this computation.

STEP 1

1.74 **Contributing Area (acres): the area contributing polluted water to the discharge point(s).**

STEP 2

Percent Paved: Percent of the contributing area that is paved

- ○ 0-24%
- ○ 25-49%
- ○ 50-74%
- ◉ 75-100%

STEP 3

Please select the location listed below that is closest to you.

- ○ Evansville, IN
- ○ Fort Wayne, IN
- ○ Indianapolis, IN
- ○ Peru, IN
- ◉ Richmond, IN
- ○ Shoals, IN
- ○ South Bend, IN
- ○ Valparaiso, IN
- ○ Versailles, IN
- ○ West Lafayette, IN

STEP 4

Animal Numbers	Animal Type	Design Weight*
0	Slaughter Steer	1,000
0	Young Beef	500
100	Dairy Cow	1,400
30	Young Dairy Stock	500
0	Swine	200
0	Feeder Pig	50
0	Sheep	100
0	Turkey	10
0	Chicken	4
0	Duck	4
0	Horse	1,000

*Design weight in pounds. Interpolation of values should be based on the maximum weight animals would be expected to reach.

END

Pollutant Load Reductions

Chemical Oxygen Demand reduction (lbs/yr)	**31,911**
Phosphorus reduction (lbs/yr)	**352**

URBAN RUNOFF BMP POLLUTANT LOAD REDUCTION WORKSHEET

Please fill in the gray areas below. Once you have successfully estimated
the sediment and nutrient load reductions, please print two (2) copies this worksheet.
Attach both copies to the 319A or 319U cost-share form.
If you have any questions, please contact Wes Stone (317/233-6299).

Please Select a Best Management Practice:

○ Vegetated Filter Strips	○ Sand Filters	○ Sand Filter/Infiltration Basin
○ Grass Swales	○ WQ Inlets	○ WQ Inlet w/ Sand Filter
○ Infiltration Device	◉ Weekly Street Sweeping	○ Oil/Grit Separator
○ Extended Wet Detention	○ Infiltration Basin	○ Wet Pond
○ Wetland Detention	○ Infiltration Trench	
○ Dry Detention	○ Porous Pavement	
○ Settling Basin	○ Concrete Grid Pavement	

Please enter landuse of contributing/drainage area in acres:

	Sewered	Unsewered
Commercial	0	0
Industrial	0	0
Institutional	0	0
Transportation	0	0
Multi-Family	0	0
Residential	5	1
Agriculture	0	0
Vacant	0	0
Open Space	0	0

Note: Sewered and Unsewered refer to storm sewers.

	Pre-BMP Loading (lbs/yr)		Post-BMP Loading (lbs/yr)		Load Reduction (lbs/yr)
BOD	121		114		7
COD	771		U		U
TSS	1,699		1,427		272
LEAD	1		U		U
COPPER	0		U		U
ZINC	5		U		U
TDS	2,398		U		U
TN	33		U		U
TKN	18		U		U
DP	1		U		U
TP	4		4		0
CADMIUM	0		U		U

U = Removal Efficiency for the particular BMP and constituent unavailable.